$$110 \quad dMv/dt=E-V$$

115
$$dM_L/dt = F-L-E$$

120
$$dH_v/dt = Eh_v(T1) - Vh_v(T_v) + \phi_E$$

125
$$dH_L/dt = Fh_F - Lh_L(T_L) - Eh_V(T_L) + \phi - \phi_E$$

130
$$E=kLA(P*-P)$$

135
$$\phi_E = uA (T_L - T_V)$$

$$140$$
 H $_{V}$ =M $_{V}$ h $_{V}$ (T $_{V}$)

$$145 \quad H_L = M_L h_L (T_L)$$

150
$$P*=P*(T_L)$$

$$155 \text{ PV}_{V} = M_{V}RT_{V}$$

$$160 V_T = V_V + M_L / P_L \cdot$$

Fig. 1 (Prior Art)

```
Mv[i]"=Fv[i]+E[i]-V[i],
Ml[i]'==F1[i]-L[i]-E[i],
Hv'==Sum[Fv[i]hfv[i]+E[i]hv[i][T1]-V[i]hv[i][Tv], {i, ncomp}],
H1'==Sum[F1[i]hf1[i]-L[i]h1[i][T1]E[i]hv[i][T1], {i, ncomp}]]}
                                                                                                                                                                                                                                                                                                                                                                                                                                                                      noTnoM4={Vt==Vv+Sum[M1[i]/Rho_1[i], {i, ncomp}]};
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     noTnoM=Join[noTnoMl, noTnoM2, noTnoM3, noTnoM4]
                                                                                                                                                                                                                                                                                                                            ncomp}],
                                                                                                                                                                                                                                                                                                                      Hv==Sum[Mv[i]hv[i][Tv], {i, ncomp
Hl==Sum[Ml[i]hl[i][Tl], {i, ncomp
Psat[i]==Pl[i][Tl],
PVv==Sum[Mv[i], {i, ncomp}]] RTv};
                                                                                                                                                                                                    E[i] == klA(Psat[i] - P),
                                                                                                                                                                                                                                     QE == uA(T1 - Tv) };
                                                                                                                                                                                                                                                                                              noTnoM3={
noTnoM1=
```

$$\begin{aligned} \varphi_{E} = 0 \\ H = H_{L} + H_{V} \\ T = T_{L} = T_{V} \end{aligned}$$
 Fig. 3

$$M=M_L+M_V$$
 $P_T=P*=P$
Fig. 4

$$M_V=0$$
 $M=M_L$
Fig. 5

Fig. 7

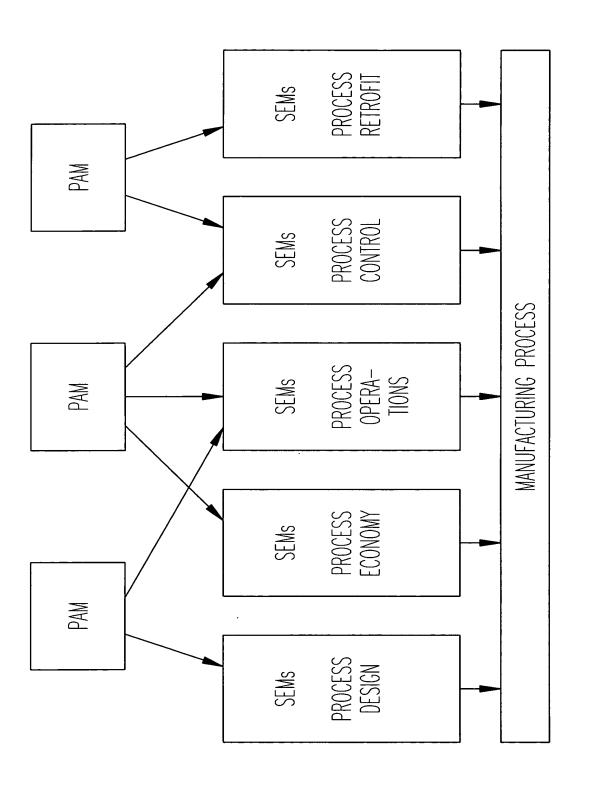
 $\text{H'} == \text{N+} \sum_{i=1}^{\text{ncomp}} \text{F1[i]hf1[i]} - \sum_{i=1}^{\text{ncomp}} \text{L[i]h1[i]} \text{[I]} + \sum_{i=1}^{\text{ncomp}} \text{Fv[i]hfv[i]}$

M[i]' ==FI[i]+FV[i]-L[i]-V[i]

 $H==\sum_{i=1}^{n\text{comp}}M[i]-0hl[i][T]$

$$dH/dt = Fh_F - Lh_L - Vh_V + \phi$$
 $H = Mh_L (T)$
 $Hig. 6$

dM/dt=F-L-V



P19.8

```
i - index for components (1, . . ., ncomp)
j - index for trays (1, . . ., ntray)
Reboiler (tray 1)
                                                                                                                                                                                                                                                                                                            in [399]:= NoThermalNoMaterial = True;
                                                          Distillation column
                                                                                                                                                                                                                                                                                                                                                                            VaporHoldUp = True;
SingleComp = False;
Flash = False;
SteadyState = True;
                                                                                                                                                                                                                                                                     ■ Specifications/Assumptions
                                                                                                                                                                                                                                                                                                                                                        Material = False;
                                                                                                                                                                                                                                                                                                                                     Thermal = False;
                                                                                                                                                                            Condens er (tray ntray)
Feed (tray nfeed)
```

F10.9

```
 \begin{aligned} &V[i][j]\mathring{h}v[i][Tv[j]]+V[i][j-1]hv[i][Tv[j-1]]),\\ &ncomp\\ 0==&V[j]-&V[j]+&\sum &(Fl[i][j]hfl[i][Tf[j]]-L[i][j]hl[i][Tl[j]]- \end{aligned} 
                                                  Out [435] = \{0 == e[i][j] + Fv[i][j] + V[i][-1+j] - V[i][j],
0 == -e[i][j] + Fl[i][j] - L[i][j] + L[i][1+j],
ncomp
0 == QE[j] + \sum_{i=1}^{n} (Fv[i][j]) + V[i][f[j]] + e[i][j]) + V[i][j] - i = 1
                                                                                                                                                                                                                                                              e[i][j]hv[i][Tl[j]]+L[i][j+l]hl[i][Tl[j+l]]),
e[i][j]==Akl(-P[j]+Psat[i][j]),QE[j]==Au(Tl[j]-Tv[j]),
ncomp
Hv[j]== \sum_Mv[i][j]hv[i][Tv[j]],
i=1
ncomp
Hl[j]== \sum_Ml[i][j]hl[i][Tl[j]],
i=1
Psat[i][j]==Pl[i][Tl[j]],
fncomp
P[j]Vv[j]==R \sum_{i=1} \sum_Mv[i][j],
i=1

                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        Rho_1[i][T1[j]] +Vv[j]}
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    M1[i][j]
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                Vt[j] == \sum_{i=1}^{ncomp}
```

Pig. 10